

WHAT IS CLAIMED IS:

1. A method of kinematics simulation using polygonal shape data in which at least a portion of a shape is approximated by a combination of a plurality of polygons, the method comprising:

5 obtaining shape data of analytic surface expression by fitting partial sets of the polygons to analytic surfaces, wherein the analytic surfaces include at least one of a cone, torus, and cylinder;

generating an assembly model based on defining a pair  
10 relationship including coaxial relationship between the analytic surfaces, the assembly model expressing a positional relationship among a plurality of components thereof, and the positional relationship corresponding to the pair relationship; and

performing a mechanical simulation by computing positions of  
15 the components according to the positional relationship.

2. The method according to claim 1, further comprising:

selecting at least one or more polygons from the polygonal shape data in accordance with a predetermined selection criterion;  
20 and

determining an analytic surface to be assigned for the one or more polygons.

3. The method according to claim 1, further comprising:

25 calculating a first representation of a first analytic surface of a first component;

calculating a second representation of a second analytic surface of a second component; and

performing an interference check for checking the presence/absence of geometric interference between the first component and the second component, according to the first representation and the second representation.

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4. The method according to claim 3, wherein the first representation includes a central axis of the first component and the second representation includes a central axis of the second component.

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5. A kinematics simulation apparatus using polygonal shape data in which at least a portion of a shape is approximated by a combination of a plurality of polygons, the apparatus comprising:

15 a data acquisition unit configured to obtain a shape data of analytic surface expression by fitting partial sets of the polygons to analytic surfaces, wherein the analytic surfaces include at least one of a cone, torus, and cylinder;

an assembly modeling unit configured to generate an assembly model based on defining a pair relationship including coaxial  
20 relationship between the analytic surfaces, the assembly model expressing a positional relationship among a plurality of components thereof, and the positional relationship corresponding to the pair relationship; and

a mechanical simulation unit configured to perform a  
25 mechanical simulation by computing positions of the components according to the positional relationship.

6. The apparatus according to claim 5, further comprising:  
a selection unit configured to select at least one or more  
polygons from the polygonal shape data in accordance with a  
predetermined selection criterion; and

5 a determination unit configured to determine an analytic  
surface to be assigned for the one or more polygons.

7. The method according to claim 5, further comprising:  
a first calculation unit configured to calculate a first  
10 representation of a first analytic surface of a first component;  
a second calculation unit configured to calculate a second  
representation of a second analytic surface of a second component;  
and  
an interference check unit configured to check the  
15 presence/absence of geometric interference between the first  
component and the second component, according to the first  
representation and the second representation.

8. The method according to claim 7, wherein the first  
20 representation includes a central axis of the first component and  
the second representation includes a central axis of the second  
component.

9. A computer program product for a kinematics simulation  
25 using polygonal shape data in which at least a portion of a shape is  
approximated by a combination of a plurality of polygons, the  
computer program product comprising:

means for instructing a computer to obtain shape data of analytic surface expression by fitting partial sets of the polygons to analytic surfaces, wherein the analytic surfaces include at least one of a cone, torus, and cylinder;

5 means for instructing the computer to generate an assembly model based on defining a pair relationship including coaxial relationship between the analytic surfaces, the assembly model expressing a positional relationship among a plurality of components thereof, and the positional relationship corresponding to the pair  
10 relationship; and

means for instructing the computer to perform a mechanical simulation by computing positions of the components according to the positional relationship.